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GUIDELINES FOR ESTIMATING

THE COSTS, SAVINGS, AND COST-EFFECTIVENESS

OF BREASTFEEDING PROMOTION THROUGH HEALTH FACILITIES

Robert Robertson
Tina Sanghvi
Ann Brownlee
John Fiedler

November, 1995

Prepared for the U.S. Agency for International Development through contract
No.LAC-0657-C-00-0051-00 LAC Health and Nutrition Sustainability
University Research Corporation/International Science and Technology Institute
7200 Wisconsin Avenue, Suite 600
Bethesda, MD 20814

ACRONYMS

CE	COST/EFFECT (COST-EFFECTIVENESS)
CEA	COST-EFFECTIVENESS ANALYSIS
DALYS	DISABILITY-ADJUSTED LIFE YEARS
EBF	EXCLUSIVELY BREASTFED
HIV	HUMAN IMMUNODEFICIENCY VIRUS
KAP	KNOWLEDGE, ATTITUDES AND PRACTICES
LAC HNS	LATIN AMERICA AND CARIBBEAN HEALTH AND NUTRITION SUSTAINABILITY
O&M	OPERATION AND MAINTENANCE
TC/Q	TOTAL COSTS/QUANTITY
UNICEF	UNITED NATIONS CHILDREN'S FUND
USAID	UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
VCR	VIDEO CASSETTE RECORDER
WHO	WORLD HEALTH ORGANIZATION

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PREFACE

The dual objective of these *Guidelines* is to assist the personnel of public and private hospitals and other health facilities and organizations in estimating the costs and cost savings of hospital-based programs that promote breastfeeding, and to conduct cost-effectiveness analyses of those programs. The primary aim is to help officials to develop better information for assessing the efficiency and effectiveness of their breastfeeding programs in order to better use scarce resources.

The *Guidelines* are a product of the Latin America and Caribbean Health and Nutrition Sustainability (LAC HNS) contract, which was funded for 1990-1995 by the United States Agency for International Development (USAID). They emerged from a series of LAC HNS studies involving the evaluation of breastfeeding promotion programs in hospitals, including case studies in Brazil, Honduras, and Mexico. During a conference on that topic in 1994, participants from the region asked the LAC HNS staff to prepare guidance to assist them in performing their own cost studies and cost-effectiveness analyses. These *Guidelines* are the response to that request.

Readers should take note of a related document that is distributed with the *Guidelines* where possible: Andrew Creese and David Parker (eds.), Cost Analysis in Primary Health Care: A Training Manual for Program Managers, prepared with Margaret Phillips, Robert L. Robertson, and Barbara McPake and published by the World Health Organization (WHO) with financial support from the United Nations Children's Fund (UNICEF) and the Aga Khan Foundation (1994). Even though the *Guidelines* are designed to be applied independently, users might find the *Manual* helpful, especially for estimating costs.

With the permission of the World Health Organization, the *Guidelines* draw heavily from the *Manual*, particularly in section II on cost estimation. Reliance on the *Manual* takes the form of verbatim quotation in some passages and slight paraphrase in others; to avoid distracting readers of the *Guidelines*, quotation marks have been omitted from the material excerpted from the *Manual* (a procedure approved by the World Health Organization staff).

The authors of the *Guidelines* are grateful to the World Health Organization for permission to use the *Manual* as described. They want to emphasize, however, that they themselves bear responsibility for the final form and orientation of the *Guidelines* with its concentration on breastfeeding promotion programs.

Figure 1 has been adapted and reproduced from the World Development Report 1993 with permission of the World Bank.

The authors acknowledge the contributions of Margaret Phillips, who developed the conceptual framework for and undertook several of the breastfeeding program cost and cost-effectiveness studies presented in this report under the Latin America and Caribbean Health and Nutrition Sustainability contract; she also commented on an early version of the Guidelines but bears no responsibility for the final results here.

I. INTRODUCTION

I.A. Why these *Guidelines*?

The objective of the *Guidelines* is to encourage and assist health specialists, staff members of general and teaching hospitals, and persons in Ministries of Health in developing countries in conducting cost-based economic evaluations of programs that promote breastfeeding of infants. The *Guidelines* emphasize the estimation of costs and cost savings of such programs and the conduct of cost-effectiveness analyses (CEAs) that relate program results to costs. The aims include assessing the effectiveness and efficiency of a program for the purposes of identifying ways to improve its coverage and quality within budgetary constraints and setting future priorities for the use of scarce resources.

As a user of these *Guidelines*, you might require access to a particular methodological text for estimating costs and the related aspects of health services, especially their effects and cost-effectiveness. Cost Analysis in Primary Health Care: A Training Manual for Program Managers[1] is an excellent resource and is the basis for the *Guidelines* in several places. With permission of WHO, the *Guidelines* even use some of the text's language verbatim or with slight paraphrase. Application of the *Guidelines*, however, does not require access to the *Manual* despite its relevancy to various topics, especially costs.

Another reference for these *Guidelines* is the set of reports generated from studies conducted in three Latin American countries (Brazil, Honduras, and Mexico) under the auspices of the U.S. Agency for International Development-funded Latin America and Caribbean Health and Nutrition Sustainability (LAC HNS) contract. Some of the project's documents are listed in the Bibliography that follows the *Guidelines*. It is not assumed that readers have seen the studies before performing their own evaluations.

The *Guidelines* are written primarily for those of you who will conduct cost studies and related evaluations. They should be of interest also to officials who will use the results. Experience with similar studies is not a requirement; neither is training in economics, accounting, or epidemiology.

The techniques described here could be applied to study any program that delivers health services. The specific focus of the *Guidelines*, though, is on the **promotion and support of breastfeeding**, in particular activities that take place in hospitals and in other facilities when used for related prenatal and postnatal services. The details and computational illustrations are confined to these programs and omit examples from other strategies for promoting breastfeeding, including mass media campaigns and mothers' support groups. The aforementioned *Manual* applies to all types of primary care and provides several illustrations.

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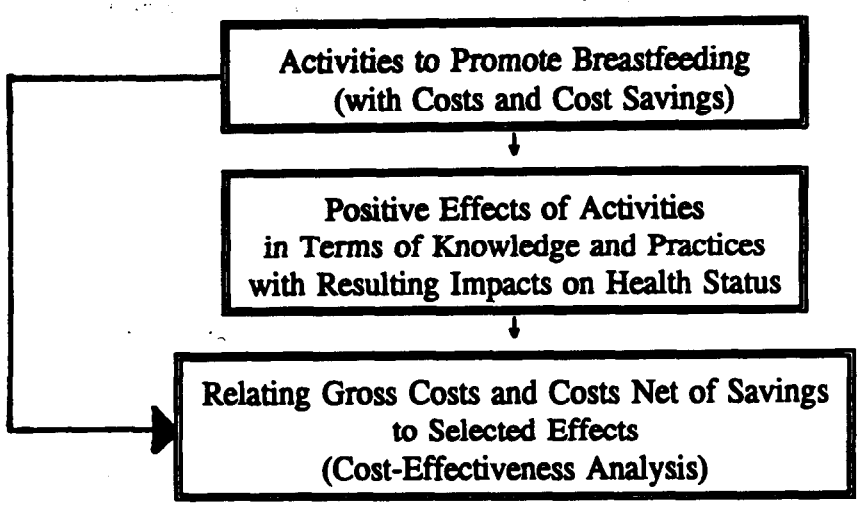
[1] Edited by A. Creese and D. Parker, with participation of M. Phillips, R. L. Robertson, and B. McPake and published in 1994 by the World Health Organization in association with UNICEF and the Aga Khan Foundation.

Detailed discussion of possible uses of the results of the *Guidelines*--costs, savings, effects, and cost-effectiveness--is not a major objective of this document. It is assumed that you have already determined the results' potential usefulness from your needs and experience. You might also check on uses found in published sources (see, for example, the 1994 WHO *Manual*, p. 1 and Modules 2, 10, 11, 12).

I.B. Conceptual Framework



The scheme on which the *Guidelines* are based (diagrammed above) embodies several key concepts and measures that can be categorized as (1) costs and cost savings, (2) effects, and (3) cost-effectiveness.

I.B.1. Costs and Cost Savings

Cost is defined as **the value of all resource inputs used to produce something**, such as a specific health service or set of services that constitute a program. Value depends on both the quantity of each input used and its unit price. Costs are usually categorized as "recurrent (operating)" costs, which are incurred regularly, and "non-recurrent (capital)" costs, which are incurred once or infrequently (less often than annually). One-time, start-up costs for programs might be covered and treated as non-recurrent costs, but often are omitted from studies because, unlike recurrent costs, they are sometimes paid for by donors and are not relevant to sustainability. Furthermore, they are relatively small for breastfeeding programs, and too variable for other activities to merit comparative analysis. Normally, you may omit start-up costs; however, if they are included, you might present your study results with and without them.

A cost-effectiveness analysis may have the effect of reducing the use of some resources, both those used in the present circumstances and those likely under any future procedural changes. The differences between the costs of the programs will yield the savings to be gained by implementing new procedures. This assumes, of course, no significant change in

the number of mothers served, and that the quality of care is the same or better. An illustration is the reduced use of breastmilk substitutes, which represents a cost saving. Whatever the case, to be most useful cost studies should, whenever possible, estimate total costs of all inputs, resulting from changes in procedures. Naturally your study tables should clearly specify the sources of the data on which all of their elements depend.

Whose costs should be covered? In principle, costs incurred by breastfeeding households such as travel and waiting time for medical care as well as the costs incurred by institutions (e.g., hospitals and health centers) could be included. The samples of household and institutional costs, however, require entirely different data that pertain to different types of decision-makers. These *Guidelines* are aimed at decisions made in and for hospitals and are thus limited to institutional costs (and savings); they do not address household values.

I.B.2. Effects

The relation of costs to outputs, for example the cost per mother trained in breastfeeding, is important. You will find it even more important, however, to be able to relate costs to knowledge, attitudes, and practices, particularly in terms of months of exclusive breastfeeding or the number of additional mothers or infants still breastfeeding after one month – that is, to intermediate effects (outcomes). If possible, measures of better health status would be applied. Impact on health status, expressed in terms of reduced morbidity or mortality, is generally difficult to measure, but the estimation of some impacts is covered in Section IV of the *Guidelines*.

I.B.3. Cost-Effectiveness

The process of relating the costs to one or more positive effects of a service or program is called **cost-effectiveness analysis**. Its formula is expressed as CE = Cost/Effect. In the case of breastfeeding promotion, one crucial measure might be the cost to a program of achieving one additional month of exclusive breastfeeding by a mother. A successful program can produce many potential effects on a patient's knowledge and practices and ultimately on health status. The effects recommended for CEA will be made clear in Sections IV and V. Despite their potential interest, most effects of breastfeeding programs on health status are too difficult to assess; as a result many CEAs focus simply on measuring outcomes.

Cost-effectiveness analysis must be distinguished from another technique commonly applied in economic evaluation: **cost-*benefit* analysis**. Cost-benefit analysis requires the magnitude of positive effects to be measured in currency units (dollars, pesos, or such). Valuing outcome or impact in monetary terms is much more difficult and questionable as to accuracy than estimating in physical units such as months of breastfeeding, number of mothers reached, or reduced infant mortality. Attempts to evaluate a breastfeeding program through cost-benefit analysis for the purpose of evaluation are *not* recommended.

I.C. Stages of the Program Studied

Even though every breastfeeding promotion program is distinguished by unique characteristics, most have common elements that can be presented in terms of the stages in the delivery process. In addition, savings generated by the program can be summarized. Table 1 presents a good illustration of these elements for the programmatic stages that include development and start-up and extend through follow-up to hospitalization. Some observers, including the LAC HNS staff, have offered briefer, more aggregative groupings of activities within a breastfeeding program. For simplicity and convenience of reading, the discussion in the *Guidelines* often uses the word "program" to refer only to *one* stage of a breastfeeding program. To conduct a CEA, cost-effectiveness must be assessed for the total of all stages that are applicable to the study hospital after estimates are made for each stage.

TABLE 1

POTENTIAL COSTS AND SAVINGS
Associated with Breastfeeding Promotion in Health Facilities

(Organized by Stages in the Delivery Process)[1]

	Costs or Use of Existing Resources	Savings
Program Development & Start-up	Lobbying or promotional activities *[Staff time, materials]* Selecting coordinator and BF committee, developing policy *[Staff time]* Initial training of staff *[Educational materials, supplies, trainer fees, if any, staff time off]*	
General On-going Costs/Savings	Refresher training and training of new staff *[Educational materials, supplies, trainer fees, if any, staff time off]* Loss of general benefits provided by companies selling breastmilk substitutes *[Equipment, supplies, educational benefits, etc., that had been provided free of charge]*	More mothers choose facility due to better image as "Baby Friendly" *[Higher patient census and thus more patient fees]*

[1] Prepared by Ann Brownlee for *Promoting Breastfeeding in Health Facilities: Course for Administrators and Decisionmakers*, "Session 6: Costs and Savings Involved in Implementing and Institutionalizing the 10 Steps", World Health Organization, Geneva, Switzerland and Wellstart International, San Diego, California, draft, 1995.

Prenatal Care	Education & counseling on breastfeeding *[Staff time, educational materials]* Loss of donations of promotional materials from companies promoting breastmilk substitutes *[Any educational materials that were provided free of charge]*	No group education & counseling on feeding breastmilk substitutes *[Less staff time and educational materials]*
Labor and Delivery		Less anesthesia and shift to local rather than general anesthesia during delivery (so mother/baby pair will be awake for breastfeeding) *[Less anesthesia, cotton, & syringes, less costly anesthesia, less mother/baby care if mother is not asleep after delivery]*
Immediate Postpartum Care	Staff assistance with breastfeeding after delivery *[Change of tasks, no extra staff needed]*	Less oxytocic medication (since with breastfeeding the body's natural release of oxytocin helps to contract the uterus) *[Less oxytocic medication, supplies (syringes, cotton), and staff time]* Less routine care of baby by staff *[Less staff time]* Less hypothermia with skin-to-skin whole body contact and thus less reheating of infant *[Less staff time]*
Nursery Care for Normal Newborns (dis-continued)		Nursery space available for other purposes *[Space available for alternative use; expenses for nursery equipment, supplies, upkeep reduced or eliminated]* Less or no care of infants in nursery and transporting of newborns from nursery to post-partum wards *[Less staff time]* Fewer or no bassinets or baby cots *[Expense for bassinets reduced or eliminated]*

Preparation of Breastmilk Substitutes	No free or low cost supplies of breastmilk substitutes *[Purchase of any supplies that had been provided at low cost or free of charge]*	Less or no breastmilk substitutes and glucose water preparation and use for normal newborns *[No staff time for preparation and feeding of breastmilk substitutes. Less or no expenditure on bottles and teats, breastmilk substitutes & glucose water, electricity, water, equipment and supplies for washing and sterilizing bottles, mixing breastmilk substitutes, etc.]*
Feeding of Babies Separated from Their Mothers	Breastmilk expression and storage *[Breastmilk expression supplies and equipment, refrigerator space - don't need breast pumps or milk bank]*	Use of expressed breast milk rather than breastmilk substitutes whenever possible *[Less purchase and preparation of breastmilk substitutes]*
Postpartum Mother/ Infant Care (Rooming-in)	One-time alternation of physical facilities, if necessary, to allow rooming-in *[Any costs for physical alternations]* Education & counseling on breastfeeding *[Nursery staff redeployed for mother/baby support on wards – no extra cost]*	More mother-to-baby care & assistance *[Less staff time for baby care- staff freed for other duties]* More mother-to-mother care & assistance *[Less staff time for mother care - staff freed for other duties]* Use of volunteer breastfeeding counselors *[Less staff time for counseling and care]* No pacifiers or bottles for breastfeeding infants *[No pacifiers or bottles supplied by hospital]* Less morbidity and mortality due to diarrheal disease, respiratory illness, sepsis, meningitis, jaundice *[Less staff time and lower costs for longer hospitalization such as medical equipment, bed occupancy, feeding and care of sick infants, intravenous fluids, etc.]*

Newborn special Care	Breastfeeding mothers of babies in Newborn Special Care Unit stay in hospital *[Space for mothers' beds, food]* No free or low cost supplies of breastmilk substitutes *[Purchase of any supplies that had been provided at low cost or free of charge]* Cup feeding of expressed breast milk *[Cups and spoons]*	Mothers of babies in Special Care Unit taught to care for own infants *[Less staff time required for infant care in Special Care Unit]* Shorter stay of babies in Special Care Unit due to breastfeeding, more care of infants by mothers, with mothers learning how to care for infants at home as well *[Less staff time, space, use of equipment and supplies]* Less morbidity and mortality due to neonatal infection *[Less staff time and other costs for longer hospitalization]*
Discharge and Follow-up	Distribution of educational literature, referral to support groups *[Staff time, educational literature]* Follow-up support for breastfeeding mothers, such as breastfeeding support during postnatal visits, lactation clinics, home visits, telephone calls and/or though mother support groups *[Costs depend on types of support provided]*	Fewer or no abandoned babies *[Less feeding costs, less staff time for care and placement of babies]* Less illness and fewer visits to outpatient department and pediatric unit due to less breastmilk substitutes and bottle feeding – less diarrheal disease, respiratory illness, allergy, malnutrition due to diluted breastmilk substitutes, etc. *[Less staff time, less medicine, and fewer other costs for patient care]*

1.D. Organization of the *Guidelines*

The remainder of this document is organized into 21 steps that you will need to follow to complete the analysis. The steps are arranged in four basic sections. Section II covers the steps for the estimation of costs. Section III describes the steps for cost savings estimation. Section IV addresses the steps in the estimation of effects. Section V deals with cost-effectiveness analyses and their uses, and is followed by a bibliography and by annexes that include all referenced worksheets and a figure.

II. ESTIMATION OF COSTS

The work recommended for estimating costs (adapted from the 1994 WHO *Manual*) requires 12 steps that are outlined below. The steps apply to cost estimation in general, estimating nonrecurrent and recurrent costs, calculating average costs, and dealing with some special considerations. The steps are presented graphically in the following box:

ESTIMATING COSTS	
STEP 1	Determine the Type of Data Needed for Decision Making
STEP 2	Identify the Activities of Your Breastfeeding Promotion Program
STEP 3	Select the Time Period for Your Study
STEP 4	Decide Upon the Number of Cases to be Studied
STEP 5	Allocate Inputs to Each Activity
STEP 6	Decide Whether to Include All "Economic" Costs or "Financial" Costs Only
STEP 7	Estimate a Year's Total Cost of Capital Inputs
STEP 8	Estimate a Year's Total Cost of Recurrent Inputs
STEP 9	Add Capital and Recurrent Costs for Total Gross Costs
STEP 10	Calculate Unit Average Costs
STEP 11	Make and Implement Decisions About Special Situations Affecting Breastfeeding Promotion Costs
STEP 12	Review the Importance of Verifying Assumptions Regarding Uncertain Values (Sensitivity Analysis)

Step 1. Determine the Type of Data Needed for Decision Making.

The reasons for the study and the study's intended use will guide you through many of the decisions that need to be made during the analysis. For example, if the study is needed to lobby for more resources for breastfeeding promotion, a comprehensive estimation of savings will be useful; or if there are some doubts about whether the program is producing any impact, a more detailed assessment of impacts may be worthwhile. If the purpose is to reduce costs, various alternative approaches may need to be explored.

Step 2. Identify the Activities of Your Breastfeeding Promotion Program.

You need to include the costs of all resource inputs used in every stage of the institutional breastfeeding promotion program under study. It is useful to begin by listing all activities that relate to the implementation of your program. Table 1 can be used as a guide for your list and to help you identify the type of inputs needed for each. For one classification of inputs, see Table 2.

TABLE 2

Classification of Breastfeeding Program Costs, by Input

NON-RECURRENT (CAPITAL) COSTS:

Equipment. Televisions, VCRs, slide projectors, refrigerators, sterilizers, bassinets, electric breast pumps, scales, other equipment with unit cost (price) of $100 or more

Buildings -- Space. Health centers, hospitals (various units), administrative offices, storage facilities

Vehicles -- Acquisition. Bicycles, motorcycles, four-wheel drive vehicles, trucks

Training or Changes in Curricula. Trainers, education materials, space, trainees, travel

RECURRENT (OPERATING) COSTS:

Personnel (all types). Supervisors, health workers, health volunteers, administrators, technicians, consultants, casual labor

Supplies. Drugs, breastmilk substitutes, manual breast pumps, bottles and nipples, educational materials, baby cots, small equipment (unit cost of under $100)

Buildings -- Operation and Maintenance. Electricity, water, heating, fuel, telephone, telex, insurance, cleaning, painting, maintenance of electricity, plumbing, roofing, and heating

Vehicles -- Operation and Maintenance. Petrol, diesel, lubricants, tires, spare parts, registration, insurance

Training. Educational material and equipment, space, trainers and trainees.

Note: Vehicles are shown here, but their cost estimation is not discussed in these *Guidelines* due to the infrequency of incurring vehicle costs for breastfeeding promotion programs.
(Source: Adapted from WHO *Manual* 1994, p. 6.)

Step 3. Select the Time Period for Your Study.

To estimate total costs properly, you must first make some basic decisions. One such decision concerns the time period for data collection and analysis. A full year period avoids any distortions that might be introduced by seasonal effects of changes in procurement prices or salaries. If there are no substantial variations in inputs or outputs within a year, a shorter period might suffice, especially for regular monitoring. A more complex evaluation performed occasionally or only once should almost always be based on annual data for a typical year.

Step 4. Decide Upon the Number of Cases to be Studied.

It is probably advisable to include all births during the study period. Nevertheless, it is possible to draw a sample of cases by following customary statistical sampling procedures not presented in these *Guidelines*.

Step 5. Allocate Inputs to Each Activity.

Another methodological decision that you need to consider at the study's outset is how to attribute inputs (and their costs) to a breastfeeding program that is one component of multiple services (including assistance in childbirth) provided by a hospital. In such cases, it is necessary to allocate the costs of shared inputs among the full range of program activities in accordance with any one of several possible criteria, such as the proportion of space or time used for each activity (including breastfeeding promotion). In any event, your report should clearly identify each allocative criterion.

Identification of inputs attributable to the breastfeeding program might be achieved by comparing the study hospital that operates the program to another hospital that undertakes little or no breastfeeding promotion activity (a "control"), if you can identify one. Ideally, you would compare the total costs of the two hospitals for the same volume of maternity patients or births after using the same method to estimate the costs for each hospital. Average costs per patient might be compared for a similar result. In fact, if the option of using a control is available, the difference between the two hospitals may represent the net costs of the promotion program, in effect having already allowed for the savings from breastfeeding.

It is, however, unlikely that a suitable control hospital will be available. To estimate the costs of a breastfeeding program in this way requires that *all* other elements in the two hospitals be very similar. The would-be control might offer some elements of your program; but, at the same time it might differ from yours in terms of size, the nature and salary rates of staff, the characteristics of patients served, wastage, and other factors that would affect costs apart from breastfeeding promotion. You must judge whether the comparability of the control hospital and cooperation of its officials appear to be sufficient to try this means of cost finding.

The other option for estimating savings uses no control hospital. Instead, it relies on one or the other of two approaches described below to obtain the data required for direct estimation of costs at your institution alone. Section III illustrates the application of these approaches.

The first approach is **historical** and ideally aims at comparing your hospital's total costs before and after implementation of the breastfeeding promotion program. Even if such a historical record exists and is based on consistent cost estimation methods, the "before and after" costs must be modified to allow for differences over time in the number of births at the hospital as well as for changes in expenses attributable to price increases, changes in quantity discounts for inputs, differences in input quality, and other variables. Probably several (perhaps three) pre-program years' values should be averaged for comparison; ideally, the average of more than one year under the program should also be calculated.

The second approach to cost estimation in the absence of a control hospital involves data collection through the use of **expert judgment** by interviewing knowledgeable members of the hospital staff to learn how much of each input category would have been required under the old system of caring for infants without special breastfeeding promotion. For comparability with experience under the program, you would have to estimate the amount and cost of each input on a per patient (birth) basis. This approach probably poses more difficulties for personnel deployment and costs than for other input costs.

In the illustrations of cost estimation that follow, it is assumed that the challenges of Step 5 (Allocate Inputs to Each Activity.) have been met such that only the breastfeeding-related inputs are shown; however, each table or computation might actually result from making separate estimates for the study and control hospitals (or pre-program and program experience hospitals) and then taking their difference. Sections III and IV on savings and effects, respectively, cover some similar considerations. Of course, the methods of estimating breastfeeding-related costs must be consistent with those used for savings and effects.

Step 6. Decide Whether to Include All "Economic" Costs or "Financial" Costs Only.

Financial costs are those indicated in the explicit monetary price of inputs used. Economic costs, though, go beyond financial costs to capture the value of all resources used that could have been used productively elsewhere. Examples of inputs that raise the question of the need to estimate economic costs are volunteers working without pay or at less than their usual rates of compensation and vaccines or other supplies donated or provided at a deep discount. Inclusion of full economic costs is strongly recommended because such costs realistically indicate future budgetary needs along with donations and subsidies that will be needed for sustainability after current contributions stop. You can usually estimate economic costs by referring to the full value for similar inputs used elsewhere where no volunteerism or discounting is involved. (You might wish to consult pp. 57 and 62 of the 1994 WHO *Manual* for more details). The

calculations that follow are assumed to include full values, but you should keep economic costs in mind for your cost estimations.

Step 7. Estimate a Year's Total Cost of Capital Inputs.

Table 2 lists several types of non-recurrent resource inputs. The usual types of activities for promoting breastfeeding through institutions would use the following capital inputs: equipment such as refrigerators, television sets, VCRs, and bassinets; and building space. Staff training with an expected effectiveness of more than one year (such as training at WELLSTART) might be included in other input categories, especially the personnel category (for both trainers and trainees). If training costs have not been included, they should be estimated separately. The multiple-year usefulness of non-recurrent inputs means that their full purchase price or value cannot simply be assigned to the specific year in which they were acquired, as illustrated in the following example for equipment. Space cost estimation is presented next. Other possible non-recurrent cost categories include vehicles and training.

Example of Estimating the Annual Cost of Equipment

Consider an example in the form of a piece of equipment (e.g., a television set) that costs $1,000 and has a useful life of 10 years. To regard the purchase as equivalent to $1,000/10 = $100 per year is to overlook an important fact. If you invest the $1,000 in this piece of equipment, the funds will be tied up for the entire 10 years. On the other hand, if you pay out only $100 per year, you could reinvest the rest ($900 in the first year, somewhat less in the second, etc.) and accumulate interest. After 10 years of paying out $100 a year, you would have some money left over from your accumulated interest. In other words, a $1,000 initial payment is equivalent to paying out more than $100 per year; but how much more depends on the earnings that money could have realized (i.e., the interest rate). Fortunately, tables make the necessary calculations simple. To calculate the economic cost of the equipment on an "annualized" (per year) basis, use the following approach:

Current value: Estimate the current value of the capital item as the amount you would have to pay to purchase a similar item at the present time (i.e., the replacement value, which requires no inflation adjustment over the original price).

Useful life: Estimate the number of years of useful life the item realistically can be expected to deliver after it is acquired.

Discount rate: Identify the discount rate (related to interest rates) used by the economic planning office or finance ministry; an easier alternative is to accept a recently adopted World Bank standard rate of 3 percent.

Annualizing factor: Consult Annex A for the correct annualizing factor, which is based on the values used for useful life and the discount rate.

Calculation of annual cost: Calculate the annual cost by dividing the current value of the item by the annualizing factor.

For a single $1,000 piece of equipment, the above approach would be applied as follows:

Current value: $1,000

Useful life: 10 years

Discount rate: 3%

Annualizing factor (from Annex A): 8.530

Calculation of annual economic cost:
$1,000/8.530 = $117/year (rounded)

To compare this economic cost with the corresponding financial cost, note that the latter would total $1,000/10 = $100/year. Taking into account the investment of funds "up-front" to pay fully for the equipment at the start of its useful life raises the annual cost. A standard table for capital cost calculations is recommended for your study. Table 3 uses the values above, among others, to illustrate non-recurrent costs.

Of course, only part of the cost of any item of equipment that offers multiple uses should be allocated to a particular use such as promotion of breastfeeding. Knowledgeable staff members can provide a reasonable estimate of the proportion of each input cost that should be allocated to the breastfeeding program (as shown in Table 3, where the proportion of time used for breastfeeding promotion is the allocative criterion).

TABLE 3

Calculation of Annualized Cost of Non-Recurrent (Capital) Inputs for Breastfeeding Program, [year]

Description of Item: Equipment	Quantity of Item	Proportion of Year Used for Breastfeeding	Current Price Equivalent	Years of Useful Life	Annualizing Factor (3%)	Annual Cost	
						Total	Breastfeeding
Television	1	40%	$1,000	10	8.530	$117	$ 47
VCR	1	100%	$ 100	3	2.829	$ 35	$ 35
Refrigerator	1	30%	$1,500	10	8.530	$176	$ 53
Total Equipment Cost for Breastfeeding Program							$135
Buildings -- Space							
Space in Maternity Wards	10 sq.m.	20%	$3,000	20	14.877	$202	$ 40
Space in Nurseries	2 sq.m.	50%	$3,000	20	14.877	$202	$101
Total Buildings -- Space Cost for Breastfeeding Program							$141
Total Non-recurrent Cost of Breastfeeding Program							$276

Note 1: For simplicity of the example, no other equipment is assumed to be used for the selected stage, Maternity Wards and Nurseries, whose costs are illustrated here.

Note 2: No other types of non-recurrent inputs such as vehicles are assumed to be used for this stage.

Note 3: No other stage than Maternity Wards and Nurseries is shown here, but the table of an actual study would include the other stages.

Note 4: Hypothetical vales have been assumed to illustrate the costs of this stage.

TABLE 4

Calculation of Personnel Costs for Breastfeeding Program, [year]

Type of Personnel	Quantity of Personnel	Proportion of Time for Breastfeeding	Basic pay per Year	Supplemental Benefits (%)	Compensation per Year	Annual Cost	
						Total	Breastfeeding
Doctor - Resident	1	5%	$20,000	20%	$24,000	$24,000	$1,200
Nurse - General	4	10%	$15,000	10%	$16,500	$66,000	$6,600
Nurse - Auxiliary	1	50%	$10,000	10%	$11,000	$11,000	$5,500
Assistant	1	20%	$ 5,000	10%	$ 5,500	$ 5,500	$1,100
TOTAL PERSONNEL COST OF BREASTFEEDING PROGRAM							$14, 400

Notes: For simplicity, no other personnel are assumed to be used for the stage, Maternity Wards and Nurseries, whose costs are illustrated here. No other stage than maternity Wards and Nurseries is shown here, but the table of an actual study would include the other stages.

Source: Hypothetical values have been assumed to illustrate the costs of this stage.

Example of Estimating the Annual Costs of Buildings -- Space

Space used for breastfeeding activities represents another capital cost of the program. Only some parts of the hospital or other facility are devoted to breastfeeding promotion, and even that space has many uses. Accordingly, you must secure and apply expert staff opinion to estimate the appropriate proportion of the full space assigned to breastfeeding.

If the annualizing approach of Table 4 is to be applied to buildings, you must obtain several kinds of information. First you need the total cost (in current replacement value terms) of constructing the building and acquiring its land. If the total cost is not available, you may be able to obtain estimates of the cost per unit area (e.g., per square meter) for such buildings.

If this is not available, use data on another building. You need to account for factors that may influence those estimates, such as the distance from the capital or the nature of the terrain as well as the nature of the structure (e.g., type of building materials and number of stories). The cost of basic furnishings and built-in equipment should also be included. If it is impossible to itemize these separately, you could consider adding 10 percent to the total cost.

The share of building cost allocated to the breastfeeding program will be based on the approximate proportion of space used for that program's activities. Even though some buildings may last longer, you should use 20 years from the date of construction as the expected useful

life of most buildings unless they are temporary structures with much shorter expected lives or general past experience in your area clearly indicates a longer period. (Again, see Table 3 for annual building costs of hypothetical example.)

The annual cost of building space can be approximated by an alternative approach that is often simpler to apply. In effect, it treats buildings as recurrent instead of capital inputs. To use it, you will probably need the assistance of a real estate agent or someone else who is familiar with the rental of buildings in your area. With this approach you would obtain an estimate of the annual price charged for renting similar space. The estimate should distinguish between furnished and unfurnished buildings and between air conditioned and non-air-conditioned space. Given the relatively small value of building space in the total annual cost of a health program, you will not need to worry about a precise estimate for identical space. Even an approximation is likely to yield a cost estimate that is as accurate as one derived by applying the more complicated annualization method.

Step 8. Estimate a Year's Total Costs of Recurrent Inputs.

Table 2 arrays several types of recurrent resource inputs. For institutional promotion of breastfeeding, the usual types of inputs would include: personnel of all types; supplies such as drugs and breastmilk substitutes; operation and maintenance (O&M) of buildings; and recurrent training with an impact of less than one year's duration. Vehicle operation costs might also be included. Training costs may or may not be included in other categories such as personnel.

Examples for estimating the costs of three recurrent inputs are explained below. These examples illustrate cost estimation for personnel and supplies. Cost estimation of building O&M is discussed but not illustrated.

Example of Estimating of Recurrent Personnel Costs

The costs of all types of personnel involved in all stages of the program should be included. If persons are not paid at all or receive less-than-normal compensation as volunteers, their full normal pay should be estimated in accordance with what they or comparable workers are paid elsewhere. Table 4 can be used for calculating personnel costs.

Salaries and wages along with other personnel expenses frequently constitute the single largest cost item in health programs. Therefore, care should be taken in estimating wages and salary values. In most cases, you will be interested in the staff directly involved in breastfeeding activities (e.g., nurses, health aides, trainers, supervisors) as well as the supporting staff (e.g., management staff, cleaners, guards, drivers).

Support costs can be allocated among programs in relation to their direct personnel costs. Naturally, only the proportion of time spent by direct staff on the program should be factored into breastfeeding cost allocations. In many cases, it is not easy to measure staff time dedicated

to a program. Promotion of breastfeeding, for instance, may be carried out as part of postdelivery care and later through general well-baby clinics. In the latter case staff during any one session are typically involved in several different activities.

Some three options of measuring time are frequently used:

- *Arrange for staff to fill out timesheets that record time spent on various activities routinely or over a certain period of time. This procedure requires appreciable supervision to be reliable;*

- *Directly observe staff on a random sample of days, recording what they do every half hour. This approach entails considerable expense and effort to a degree that is rarely feasible.*

- *Rely on staff's memories. If these techniques are too difficult or expensive, you must make rough estimates of the uses of shared time for multiple activities, even if the estimates require reliance on staff memories.*

The full cost of employing personnel is represented by the individual's gross earnings, that is, the individual's take-home pay together with taxes and charges for any supplemental benefits that may have been deducted (for example, employee contributions to health insurance, social security, and pension plans). These gross earnings should include any special incentives, bonuses reflecting overtime or hardship, holiday and sick pay, and uniform, housing, travel allowances and pensions. If the worker receives any additional commodities, housing, or nonmonetary benefits, the value of these benefits should also be estimated by using the prevailing prices of similar items (such as current market rental rates for comparable housing). Once calculated, it is likely that the value of all employees' supplemental benefits can be roughly averaged as a percentage of base pay. This percentage can then be applied to each employee's pay rate to estimate full compensation.

Expenditure records and payrolls of public sector employees might be available at your hospital, and also are maintained in the Ministry of Health, and include cost data on salaries and allowances. Other types of information might be maintained elsewhere. For example, pensions may be paid by the civil service board or another agency, and per diem allowances are often paid by external agencies. Private market data can help in the valuation of such nonmonetary benefits as housing. Using hypothetical data, Table 4 presents a form for recording and calculating personnel costs that incorporates an allowance for supplemental benefits.

Example of Estimating of Recurrent Costs for Supplies

Recurrent costs cover materials used in the course of a year (but not those acquired only for inventory) in order to produce program activities. It also includes any items whose unit costs are so small that they are not worth treating as capital resources for annualization. A price of

less than $100 is a good indication that you should consider an item a supply instead of equipment. Bottles and nipples for breastmilk substitutes even if used for more than a year are examples of supplies. Some other examples of supplies for a breastfeeding promotion program are breastmilk substitutes, glucose water, educational pamphlets and posters, and drugs (e.g., methergin and oxytocin).

The full cost of supplies should include the cost of transportation to the point of use (including any freight charges as a result of importing materials and any internal distribution costs), as well as the cost of storage. The cost should cover all the materials consumed, including those lost or wasted, as well as that used for its intended purpose. Loss can result from misplaced shipments, damage from water and rodents, pilferage, and expiration of materials' useful life. Any loss must be paid for out of the program and should be included in cost estimates.

Unless expenditure records are extremely detailed they are unlikely to be useful for estimating the costs of most of the materials specific to the program. Instead, you will need information on quantities and prices of the supplies used at a hospital. Hospital records and materials catalogs will probably be sufficient to provide the needed information. You can supplement them as necessary with data from higher-level stores. You should apply the full market prices of supplies, not merely subsidized values, to estimate costs. (This is another instance of using economic rather than financial costs.)

Table 5 illustrates the calculation of the cost of supplies based on hypothetical data. For simplicity, it (like Table 4) applies to only one of the several stages of breastfeeding promotion -- maternity wards and nurseries -- that do not use methergin or oxytocin as inputs. Those items would be included in the more comprehensive tabulation for all stages that would be used in your actual study (omitted here).

TABLE 5

Calculation of Supply Costs for Breastfeeding Program, [year]

Type of Supplies	Quantity	Proportion used for Breastfeeding	Price	Annual Cost	
				Total	Breastfeeding
Breastmilk Substitute	300 tins, 500 gm.	100%	$5.00	$1,500	$1,500
Glucose Water	100 bottles, 500 ml	100%	$2.00	$ 200	$200
Bottle (and Nipple)	500 each	100%	$2.00	$1,000	$1,000
Pamphlets	2,000 each	100%	$0.05	$ 100	$ 100
Total Supply Cost of Breastfeeding Program					$2,800

Notes: For simplicity, no other supplies are assumed to be used for the stage, Maternity Ward and Nurseries, whose costs are illustrated here.
No other stage than Maternity Wards and Nurseries is shown here, but the table of an actual study would include the other stages.

Source: Hypothetical values have been assumed to illustrate the costs of this stage.

Example of Estimating of Recurrent Costs for Operation and Maintenance (O&M) of Buildings

This category of inputs is easily handled. Although observers are sometimes concerned with such costs as utility expenses, these costs account for little of the total costs for most health programs, including breastfeeding promotion. If available bills and records do not readily yield the needed information, you can probably use a simple approximation based on past experience with these expenses.

Generally, O&M costs include charges for electricity, water, and other utilities and for materials used in cleaning, painting, and repairs. You should include compensation for guards, cleaners, and maintenance workers in the personnel category, and not in the O&M category. Of course, only the proportion of expenditures for utilities and materials attributable to breastfeeding promotion should be calculated. A good basis for allocating total O&M costs to the breastfeeding program is the share of institutional space used for breastfeeding adjusted for the proportion of time the space is used for the program. No illustrative table appears necessary to guide you for this simple cost category.

Step 9. Add Capital and Recurrent Costs for Total Gross Costs.

After you have implemented the above cost estimation steps you will be able to summarize the total gross costs as illustrated in Table 6. You will then be able to total the gross cost of all stages as displayed in Table 7. The grand total from Table 7 will be used for the gross costs entry later, when cost-effectiveness is calculated. Tables 6 and 7 allow you to compile a total cost profile for your breastfeeding promotion program (shown only for the one stage in Table 6). The profile simply indicates the percentage distribution of total cost among categories of inputs for a given stage (as in Table 6) or for the entire program (which could be added to Table 7).

TABLE 6

Total Gross Cost of Breastfeeding Promotion Program, [year], by Input, for Stage: Maternity Wards and Nurseries

Input Non-recurrent Costs	Input Cost (Annual)	Profile % of Total Cost
Equipment	$135	0.8%
Buildings -- Space	$141	0.8%
Total Non-recurrent Costs	$276	1.6%
Recurrent Costs:		
Personnel	$14,400	82.4%
Supplies	$ 2,800	16.0%
Total Recurrent Costs	$17,200	98.4%
Total Gross Cost of Breastfeeding Program	$17,476	100.0%

Notes: In an actual study, similar cost estimates would be shown for every stage.
No other types of inputs are assumed for this stage.
Source: Tables 3, 4, 5.

TABLE 7

Total Gross Cost of Breastfeeding Promotion Program, [year], by Stage and Input

Stages Inputs Non-recurrent:	General On-going Costs	Prenatal Care	Delivery Room	Maternity Wards & Nurseries	Postnatal Care	Total, All Stages
Equipment				$ 135		
Building -- Space				$ 141		
Others (if any)				- - -		
TOTAL NON-RECURRENT				$ 276		
Recurrent:						
Personnel				$14,400		
Supplies				$ 2,800		
Others (if any)				- - -		
TOTAL RECURRENT				$17,200		
TOTAL				$17,476		$

Notes: In an actual study, cost estimates for all stages would be included.
Regarding the stages here in relation to those of Table 1: Program Development and Start up, and neonatal intensive care usually would be omitted; therefore, they are omitted here.
"Delivery Room" here covers both Labor and Delivery and Immediate Postpartum Care.
"Maternity Wards and Nurseries" covers all stages from Nursery Care for Newborns through Rooming-in.
"Postnatal Care" covers newborn Special Care and Discharge and Follow-up.
The Gross Cost total in the lower right hand box is the value that would be used in Table 12.

Sources: Table 6 for every stage included in the study.

Step 10. Calculate Unit (Average) Costs.

For some uses it is helpful also to build on the above cost estimation steps to calculate unit (average) costs by applying the following formula:

Unit Cost = Total Cost/Quantity, or TC/Q.

For a breastfeeding promotion program, various unit costs related to quantities might be of interest such as the number of mothers contacted for education and counseling. You will see

that unit costs usually refer to outputs short of the outcome effects of greatest interest (e.g., number of mothers exclusively breastfeeding).

Some unit costs apply to specific inputs and are suggestive of elements of program efficiency. An example is *personnel* cost per mother contacted for education. Such averages vary among studies and are simple to calculate, so no illustration of them is given here.

Step 11. Make and Implement Decisions About Special Situations Affecting Breastfeeding Promotion Costs.

Three particular challenges face those conducting studies. These include: prices, foreign exchange and adjusting for inflation.

- **Prices**

Obviously, correct information on the prices of resource inputs is crucial to cost estimation. Examples of some special cases, such as personnel compensation, have already been given. Perhaps the most important rule to keep in mind concerning prices is to find and use the equivalent of full market value. If an artificially low price is apparent -- for example for drugs obtained at a subsidized hospital pharmacy or free gifts of formula -- an allowance must be added to yield the true value (or economic cost). Most prices will probably be readily available to you. A particular price can be applied to all stages of the program that use the same input.

- **Foreign Exchange**

Because they are obtained from other countries, inputs that require foreign exchange pose complications for determining true costs. Important supplies such as certain drugs and equipment are among the resources that often require foreign exchange for imports. To value these inputs in economic cost terms necessitates the use of an exchange rate that expresses the value of foreign currency in terms of domestic currency. The official exchange rate might be unrealistically set by the government in comparison with actual currency markets' rates. Usually, foreign exchange in developing countries is in short supply. However, the official exchange rate frequently does not reflect this shortage, and makes foreign exchange appear less costly, thus undervaluing the costs of imported inputs. Most health officials cannot be expected to make exchange rate adjustments. Therefore, if expertise is available through specialists, it should be tapped for calculations; otherwise, you may reasonably call attention to the possible existence of foreign exchange distortions. At the institutional level, it should be acceptable to apply the stated (unadjusted) prices for your cost estimates.

Information on the origin of an input and its foreign exchange requirements can be useful for more than making cost estimates. When the results of the study are to be used to predict and budget for future program activities, the potential implications for scarce foreign exchange could be important. These *Guidelines* do not stress the financing of a breastfeeding program, but

issues related to a program's funding would be pertinent to a full economic evaluation of the program that has the objective of helping financial policy makers.

- **Adjusting for Inflation**

Under some circumstances, it will be necessary to adjust prices for inflation when health program costs are estimated. This would be a special concern when several years of activity are involved -- for example in longitudinal analyses of programs. These *Guidelines* do not assume that your study period extends over several years, and thus they do not detail procedures for adjustments for inflation that yield comparable "real" costs. If the basic approach to estimating costs and cost savings (Section III) requires the use of historical costs in the absence of a control hospital, inflation adjustment might be needed but will not prove difficult. If you are in doubt as to the use of a particular price index, you should consult an economist or financial specialist.

Step 12. Review the Importance of Verifying Assumptions Regarding Uncertain Values (Sensitivity Analysis).

It is often necessary to make assumptions about some variables whose exact value is uncertain. These variables can be involved in calculating either costs or effectiveness. For example, not all sources would agree with the World Bank figure of 3 percent as a discount rate for annualized capital costs. Similarly the estimates of the amount of time that staff devote to a breastfeeding program may be approximate (a fairly common problem). At other times you may have a variable such as a price that has changed over time, causing you to use the average value for that variable.

To deal with uncertainty over a particular assumption, you should indicate a plausible range of values for the assumption or take (1) your best estimate, (2) twice that estimate, and (3) half of it. By using each of these three values (or the extremes of the plausible range), you can explore how the results of your analysis change depending on the value taken by the variable. If the result changes dramatically, it is said the conclusions are "sensitive" to the assumption about that variable. The process of testing how changes in assumptions affect changes in results is called "sensitivity analysis." It is wise to conduct sensitivity analyses and to summarize their results in your study report.

Table 8 presents a sensitivity analysis based on uncertainty regarding information on employment of certain personnel for one stage of breastfeeding promotion. Suppose that there is doubt concerning the accuracy of the assumed proportion of time that four general nurses spend on breastfeeding promotion in maternity wards and nurseries as part of their total work year. In table 4, the proportion used is 10%, but the data source is weak and the proportion might be twice as great, or 20%, which would increase those nurses' cost for breastfeeding promotion by $6,600. (It is assumed that there is little likelihood that it would be lower that in in Table 4.) The following calculations, based on Tables 4 and 7, indicate the sensitivity of cost results to the value of that proportion.

TABLE 8

Illustration of Sensitivity Analysis: Personnel Costs

Annual Cost Estimates			
Stage of Maternity Wards & Nurseries	**Value of Proportion 10%**	**20%**	**Percentage Change for 20% over 10%**
Total Personnel Cost	$14,400	$21,000	+ 46%
Total Cost, All Inputs	$17,476	$24,076	+ 38%

Note: **Comments concerning results of the sensitivity analysis: Total Personnel Cost: The percentage increase (46%) is appreciable, that is, results are quite "sensitive" to the value of the proportion. Total Cost of All Inputs: This increase (38%) is also appreciable. It can be seen from Tables 4 and 7 that a doubling of the cost estimate for non-recurrent inputs or for supplies would reveal much less sensitivity to most assumptions.**

Sources: **Tables 4, 7.**

III. ESTIMATION OF COST SAVINGS

Importance of Estimating Cost Savings

It is likely that a successful breastfeeding promotion program will yield appreciable savings in resource inputs, used that is, reductions in costs for the hospital or other institution. Estimates of savings can be put to several important uses by hospital officials and others. Subtracting savings from gross costs yields the net costs that are pertinent to cost-effectiveness analysis, and thereby demonstrates program efficiency. The realization of savings, which might be even larger than gross costs, enables advocates of breastfeeding promotion to inform policy makers of true program costs. This section explains the steps for estimating cost savings.

ESTIMATION OF COST SAVING	
STEP 13	Calculate Savings (Repeat Steps 5 Through 12 to estimate the Value of Inputs Saved)
STEP 14	Subtract Savings from Gross Costs

Identifying Savings and Net Costs

Section II addressed the estimation of gross costs; this section considers ways to estimate savings. Calculation of net costs should be simple once gross costs and savings are known. While households might enjoy savings, for example in reduced purchases of infant formula as

a substitute for breastmilk, values for households are not included in the *Guidelines* or suggested for study.

What are the major sources of savings from a breastfeeding program? It appears from case studies that the largest (or at least the most readily estimated) savings are attributable to:

- less (or no) use of breastmilk substitutes and glucose water, thereby reducing consumption of those supplies and the need for bottles as well as saving personnel time for preparation and feeding (space might also be saved); and

- less use of oxytocin and methergin, reducing those materials and the work time of personnel, such as nurses.

It is also reasonable to expect measurable savings from:

- less counseling of mothers on formula feeding, thus reducing personnel time and perhaps the use of "educational" materials on formulas;

- less care of infants by nurses and other personnel due to rooming-in because mothers do more for themselves;

- shorter hospital stays (including stays in the neonatal intensive care unit) due to breastfeeding, lower morbidity and mortality among breastfed infants, and better general care by mothers -- all of which reduce the use of several inputs, with resulting savings.

Table 1 lists still other possible savings. When you plan the cost study of your hospital-based breastfeeding program, you can decide what other savings categories should be covered and whether their inclusion requires any additional data collection and cost calculations.

Step 13.	**Calculate Savings (Repeat Steps 5 Through 12 to Estimate the Value of Inputs Saved).**

In principle, savings from a breastfeeding promotion program at a hospital (and any associated facility) are documented by comparing institutional costs with and without the program. Additionally, different modes of breastfeeding programs might also be compared -- for example, utilizing different means of promotion. Hence, the steps that you must follow for estimating cost savings are essentially the same steps required for cost estimation. They include: allocating inputs to each activity; deciding whether to include all economic costs or financial costs only; estimating a year's total costs of capital inputs and of recurrent inputs; estimating a year's total gross costs; calculating unit (average) costs; making and implementing decisions

about special situations affecting breastfeeding program costs; and undertaking sensitivity analysis (reviewing the importance of verifying assumptions regarding uncertain values).

As explained in Section II, three basic options apply to cost finding: use of a control hospital; use of historical data; and expert opinion. Data sources and estimation methods for program and control hospitals are described in Section II. The forms needed to guide data collection under any approach necessarily will vary with your specific program and the type of input as well as with your study needs. Worksheets for your guidance are shown in Annex B. These cover the following types of potential savings in supplies: breastmilk substitute, glucose water, and bottles and nipples. They outline the data needed from historical records covering both pre-program and program years and from surveys of experts (and the calculations to be made from their responses). Naturally, the information identified in these worksheets would need to be obtained for all stages of the breastfeeding program. Hypothetical values have been assumed for purpose of illustrating certain cost savings for one stage summarized in Table 9. As noted above, cost savings are interesting and useful in their own right. In addition, a grand total of cost savings, when completed for all stages and inputs, would provide the "cost savings" entry for cost-effectiveness estimates later.

TABLE 9

Cost Savings Due to Breastfeeding Promotion Program, [year]:
Supply Cost Savings

Type of Supplies	Amount of Savings
Breastmilk Substitute	$1,200
Glucose Water	$ 150
Bottles and Nipples	$ 850
Total Costs Saved on Supplies	$2,200

Notes: For simplicity, no other supplies are assumed to be used for the stage, Maternity Wards and Nurseries, whose costs are illustrated here.
Similar to Tables 6 and 7 for gross costs, in an actual study, tables would be created for cost savings to show them for each stage that has savings and a table would contain a summary for all stages and inputs. Such tables are omitted from these guidelines.

Source: Here, hypothetical values have been assumed for illustrations. Worksheets in Annex B as well as their equivalents for other categories of inputs for all stages would be used as the sources in an actual study.

Step 14. Subtract Savings From Gross Costs.

Once you have calculated total annual savings, subtract them from total annual costs estimated in Section II to obtain net costs or (if savings are greater that costs) net savings of your program. Total cost savings will be useful in Table 12 on cost-effectiveness that is covered below.

IV. ESTIMATION OF EFFECTS

A critical component of cost-effectiveness analyses is demonstrating the relative effectiveness of alternatives--generally a new or proposed intervention compared to an old or existing program--in common or comparable units of measurement. This permits an assessment of the magnitude of incremental effects, which can then be compared with incremental (net) costs. Those not planning to undertake primary data collection but intending instead to use existing estimates of effectiveness will need to examine the issues before selecting appropriate sources of data and interpreting them correctly.

Estimating the effects of alternative interventions requires the application of various epidemiological techniques, a detailed explanation of which is beyond the scope of these *Guidelines*. Nevertheless, this section highlights some important considerations in estimating effects and includes the following steps:

ESTIMATION OF EFFECTS	
STEP 15	Decide what effects to measure
STEP 16	Select indicators of effectiveness
STEP 17	Develop a research design
STEP 18	Present the results of effects estimation
STEP 19	Analyze and interpret the results of effectiveness studies

Step 15. Decide What Effects to Measure.

Any intervention to promote breastfeeding produces a series of consequences. The first will be the **outputs** of goods and services such as providing talks or pamphlets to mothers in postpartum wards or in pre- and postnatal clinics and helping mothers nurse their newborns in the delivery room. These outputs have **outcomes** in terms of improved knowledge, attitudes, and practices (KAP), which may include more confidence and skills among mothers and changes in breastfeeding practices or behavior (such as how long a mother breastfeeds exclusively, what type of supplement a mother uses, and whether a mother breastfeeds after returning to work).

Eventually, the breastfeeding promotion intervention is expected to produce such **impacts** as reduced infant disease and mortality, lower fertility, and improved productivity and well-being of the population.

Outputs and outcomes can serve as partial measures of effectiveness. They do not, however, always yield expected impacts because of the role of other influences on impacts. One advantage to measuring outputs and outcomes is that they are easy to measure, and the data may be already available through service records. Impact data, by contrast, are difficult to interpret, particularly in terms of attributing changes to program activities in the context of the broad range of social and economic factors that influence these effects.

Usually, for the purposes of identifying best packages or interventions, one primary effect may be all that requires measurement. For breastfeeding program evaluations, however, the selection of a single measure of impact presents a special problem because of the different types of breastfeeding effects that cannot be combined into one. For example, reductions in fertility and mortality demand separate measurement and reporting. Accordingly, measurement of an intermediate indicator such as breastfeeding practices may be more meaningful. The criteria for selecting an intermediate indicator include the following:

- It must occur in all interventions subject to comparison;
- It must capture all the important differences between alternatives subject to comparison;
- It must be measurable.

This is illustrated by the example of Latin America and Health and Nutrition Sustainability's (LAC HNS) studies conducted in Brazil, Honduras, and Mexico. In this set of studies, **duration of exclusive breastfeeding** was the preferred effectiveness indicator based on the recent literature's emphasis on breastfeeding's mortality- and morbidity- suppressing effects and the low prevalence of exclusive breastfeeding. In Brazil and Honduras the programs focused on encouraging exclusive breastfeeding. The programs in Mexico were directed toward extending the duration of *any* breastfeeding. The results showed minor impacts on the duration of exclusive breastfeeding for Mexico (one-half to one-day differences) as compared with any breastfeeding durations (estimated to differ by several weeks).

The decision on what effect should be the focus of the CEA is also closely related to the reason for the analysis, the goals of the specific program, and the type of effects expected by knowledgeable staff. If the purpose is to compare a wide range of health and nutrition interventions or to compare unlike ones, such as chemotherapy for tuberculosis or vitamin A supplementation with breastfeeding promotion, then measuring morbidity and mortality effects or, even better, effects on disability-adjusted life years (DALYs) may be useful. The World Bank has proposed the latter measure to compare unlike health interventions because it captures

all three important health effects--mortality, morbidity, and disability--in a single number. (For more information on DALYs, see Horton, 1994; Jamison, 1993; Murray and Lopez, 1994).

In principle, calculating DALYs is more difficult than calculating only one type of health effect as it requires estimates of impacts on mortality, morbidity, and disability, which are then converted into a stream of healthy years of life with future years discounted and each year weighted by age to reflect societal value placed on individuals of different age groups. Fortunately, the calculation of all elements of DALYs except disability can be performed easily for breastfeeding programs by multiplying the number of infant deaths averted by 32.5 years (World Development Report, 1993, pp. 26-27).

Measures such as mortality, morbidity, and DALYs may not be necessary for all CEAs. If the objective of the analysis is to identify priority interventions for diarrheal disease control only, for example, then diarrhea-related effects such as number of diarrhea cases and deaths from diarrhea averted due to breastfeeding will suffice. Another purpose may be to assign priorities within breastfeeding promotion interventions; if so, effects on the duration of exclusive breastfeeding may be sufficient. Other potentially useful measures include the number of women intending to breastfeed for at least four months; the number of women who recalled receiving key messages (when to introduce liquids, how to identify and correct low milk supply, and where to go for breastfeeding help); and the number of women who said they know certain critical breastfeeding skills (positioning and latching-on, increasing milk supply, manual expression of milk, and relieving nipple problems).

Tables 10 and 11 illustrate the use as well as calculation of two important types of effects whose values are hypothetical. The tables measure exclusive breastfeeding outcomes and health status impact in the form of diarrheal deaths averted. The tables demonstrate a comparison of program and control hospitals using by a sound study design.

TABLE 10

Calculation of Effect of Breastfeeding Promotion Program, [year],: Number of Infants Exclusively Breastfed

Percent of Infants Exclusively Breastfed (EBF):	
Control Hospital 19.9%	
Program Hospital 43.4%	
Number of Births per Year in Program Hospital 1,188	
Number of Infants Exclusively Breastfed in Program Hospital at Control Hospital's EBF Prevalence (1,188 x 0.199)	236
Number of Infants Exclusively Breastfed in Program Hospital Program Hospital's EBF Prevalence (1,188 x 0.434)	516
Difference Between the Two Hospitals Equals Additional Number of Infants Exclusively Breastfed (the effect)	280

Source: Hypothetical data assumed to have been collected from program and control hospital.

TABLE 11

Impact on Diarrheal Mortality of Differences in Breastfeeding Practices, [year]

Practice	Hospital		Risk of Diarrheal Mortality in Relation to Practice[1]
	Program (A)	Control (B)	
Not breastfed	23.7%	35.4%	14.2
Partially breastfed	32.9%	44.7%	4.2
Exclusively breastfed	43.4%	19.9%	1.0
Total Attributable Risk:			
Program Hospital (A) = (43.4x1.0) + (32.9x4.2) + (23.7x14.2) = 518.1			
Control Hospital (B) = (19.9x1.0) + (44.7x4.2) + 35.4x14.2) = 710.3			
Percentage Reduction in Diarrheal Mortality = B-A x 100 = 27.1%			
Assuming 13.5 diarrheal deaths per year per 1,000 infants[2] and using the 27.1% reduction due to the program, yields a reduction of 3.66 diarrheal deaths per year per 1,000 infants.			

Note: ARI deaths could be calculated similarly.
Sources: Hypothetical data assumed to have been collected, except for:
[1] Victora et al. 1987; and
[2] Huilan et al., 1991.

Step 16. Select Indicators of Effectiveness.

Selecting the indicator of effectiveness requires identifying as precisely as possible: the population to whom the results should apply; the population from which a sample should be drawn; the breastfeeding behavior of interest or morbidity or mortality; the geographic area; and the time period. As noted in the LAC HNS studies for example, the principal indicator was duration of exclusive breastfeeding (number of days and number of additional women/infants exclusively breastfeeding at one month) for low-income urban women delivering in the program hospitals during a one-year period.

An important consideration in indicator selection is whether the resources are available to collect the data necessary for estimating desired indicators. For example, are the data already available to you? Is trained manpower available or can personnel be trained to collect the primary data? Can the personnel be mobilized and supervised adequately? Can the data be

cleaned, entered into computers, and prepared for analysis within the study's budgetary and time limitations? If the necessary resources are not available, two alternatives can be explored. One is the secondary analysis of existing data; the other is using estimates from the literature. An illustration of using estimates from the literature is given in Table 11.

Existing raw data provide another approximation of the desired indicators of effectiveness that can be estimated without excessive costs and time delays. If it is necessary to accommodate data deficiencies, you may need to make educated guesses about the likely ranges of the desired variables. You should do so with caution, however, and in consultation, if possible, with experts in breastfeeding and epidemiology who can justify your ranges based on convincing evidence from elsewhere. The use of ranges of estimates is further discussed under sensitivity analysis in Step 12.

If resource constraints for primary data collection are severe, you may have to select another effectiveness indicator for which data are more readily available. For example, the number of mothers who **intend** to breastfeed exclusively for at least four months might be used instead of exclusive breastfeeding, particularly if other research has demonstrated a strong association between intentions and practices in the study population.

To anticipate future periodic program evaluations, you may find it useful to initiate the routine collection of data on selected effectiveness indicators as part of the institutional monitoring of service delivery. Effects estimation and cost-effectiveness analysis based on such routine monitoring can be complemented with less frequent (annual or biennial) surveys of mothers after discharge from hospital to confirm program impact and to validate the association of monitoring indicators with behavioral outcomes.

In the example of the LAC HNS study, the population consisted of normal births. Exclusion criteria were similar across hospitals and countries. In all hospitals, mothers were not eligible if they or their infants were admitted into the intensive care unit or did not wish to participate. In Mexico and Brazil, residence outside the city where the hospital was located was an exclusion criterion as well. In Brazil, criteria for exclusion also included birth weight < 2000 grams; birth anomalies that prevented normal suckling; other birth defects associated with breastfeeding difficulties; maternal medical conditions such as eclampsia, HIV infection, psychological problems, deafness, breast anomalies, and certain medications (lithium, thyroid, and chemotherapy drugs); and mothers planning to give up their infant for adoption. Future interpretations of these findings will qualify the results and conclusions as applying to non-high-risk infants and mothers.

An indicator of exclusive breastfeeding status was developed based on 24-hour recall. A mother was asked to enumerate everything the infant consumed from the time it awakened on the previous day until it woke up on the morning of the interview. These lists were noted and coded. Later, by using a computer, the infants were categorized by following WHO definitions of exclusively breastfeeding, partially breast feeding, or not breastfeeding. Consumption of water, teas, and juices in addition to breastfeeding was considered partial breastfeeding. For each

infant, the status of breastfeeding on the day before the interview was used to estimate the median duration of exclusive breastfeeding in each comparison group. It is possible, however, that some infants had already begun consuming other liquids earlier, even if they did not consume those liquids on the day of the interview; thus the duration of exclusive breastfeeding may have been overestimated. Another option would be to ask when other liquids were first introduced and to use the mother's recollection of the infant's age at termination of exclusive breastfeeding. However, this approach may introduce a recall bias. Yet, given that the objective is to compare durations, and there is no reason for one group to under- or over-report durations systematically, any one of the estimates may be used. Because the goal of CEA is to set priorities based on relative merits, any minor measurement errors that do not produce systematic biases would be less significant than in other types of research.

The LAC HNS analyses used a combination of primary data for some parameters and existing estimates of other parameters from the literature. The main objective of the studies was to estimate the comparative intermediate effects (outcomes) of different packages of breastfeeding promotional services. Accordingly, the studies selected the duration of any (Mexico) or exclusive (Brazil, Honduras) breastfeeding as the indicator of effectiveness. In addition, demonstrating the favorable cost-effectiveness of breastfeeding promotion vis-á-vis other health interventions through the estimation of impact was an important secondary objective. Because study resources permitted direct measurement of breastfeeding practices but not of mortality or morbidity, the study used the existing literature for estimates of relative risks of mortality associated with breastfeeding practices in southern Brazil (Victora, 1987) and of the diarrheal mortality rate (Huilan, 1991). Those preexisting estimates of relative risks in combination with actual breastfeeding practices measured in the studies yielded estimates of the magnitude of mortality reductions in the control and program hospital populations. (Similarly, other work in Brazil on morbidity [Martines, 1988] was used to estimate morbidity effects of breastfeeding promotion programs.) Estimates from the literature were selected largely because they came from the most recent well-designed studies conducted in one of the LAC HNS study countries, thus making it possible to extrapolate. So far, similar data from other regions are not plentiful. To extend your own CEA of breastfeeding promotion to include health status impacts, you might search for and find similar sources.

Step 17. Design the Study.

Once the decision has been made to collect primary data or to evaluate existing data sources, you will need to consider research design issues. For example, estimating the relative effectiveness of two alternative interventions, e.g., two types of breastfeeding promotion programs, requires following two groups of subjects each one treated with one intervention for the development of desired outcomes (e.g., intention to breastfeed exclusively for at least four months or increased duration of exclusive breastfeeding) or impacts (mortality and/or morbidity reduction). To conclude that the interventions are either equal or different requires the assumption that the only difference between the two groups is the exposure to the interventions.

Researchers generally follow two main approaches to study design. The first calls for a survey of randomly selected households or mothers in an area where families use different program services, thus making it possible to compare the KAP or health impacts associated with different programs. The second calls for women to be recruited at each hospital or clinic, that has been chosen for certain program attributes, such as matched socioeconomic status of mothers and significantly different programs.

An important concern with the design and interpretation of studies that do not randomly assign subjects, is selection bias. For example, certain types of mothers may have chosen to attend certain hospitals; the mothers' characteristics may have influenced breastfeeding practice. With respect to selection bias, one strategy employed by the LAC HNS analyses was to include a question in the mothers' interviews on reasons they chose one or the other hospital for delivery. The results showed no stated preference for the intervention hospital because of its superior breastfeeding promotion program. This, together with multiple regression that controlled for critical confounding variables, greatly enhanced confidence in the results as attributable to program effects as opposed to differences in the subjects' characteristics. If similar methods appear necessary for control purposes, you might need to consult a statistical specialist.

Given that breastfeeding practices can be influenced by a variety of factors apart from promotion activities, information on variables such as the following should be collected as part of the evaluation: working status of the mother, nature of the mother's work environment, delivery in a breastfeeding-friendly environment, health practitioners' advice, influence of family members, perceptions/social norms in the population, and access to subsidized breastmilk substitutes. The evaluation should determine if the comparison groups differed in these attributes.

In some countries, national health and demographic surveys may be helpful for your study of breastfeeding effects. You might be able to add a short series of questions on program exposure and exclusive breastfeeding by simply recording the place of the last child's birth and determining which hospitals were certified "Baby-Friendly" (UNICEF Baby Friendly Hospital Initiative).

Step 18. Calculate the Results.

The results might include additional mothers or infants exclusively breastfeeding at a specified age, additional days of exclusive breastfeeding, or such impacts as deaths averted. Tables 10 and 11 show some of these effects, but do not illustrate all the possibilities. The Figure in Annex C shows a World Bank application of DALYs gained, with equivalent information added for breastfeeding promotion.

Indicators of effectiveness may be expressed in terms of absolute numbers or proportions (percentages). Both can be used for cost-effectiveness analysis, but numbers are much simpler to explain and understand. For example, cost per additional day of breastfeeding per woman or cost per additional infant exclusively breastfed at three months is more readily grasped than cost per additional percent of infants breastfed. To derive numerical estimates, however, it is usually necessary first to estimate changes in percentages and then use some denominator to convert changes to numbers of women or infants, deaths prevented, or the like.

Step 19. Interpret the Results.

The objective of the analyses is two-fold: to determine whether the comparison groups differ in effects and to estimate the magnitude of an effect that can be attributed to differences in interventions in a way that can be matched with cost comparisons. In both cases, the issue at hand is to establish causation as a prerequisite to proper interpretation of the results. To verify that the observed differences are not random but related to interventions in a statistically significant way, conventional statistical techniques such as the t-test, analysis of variance, and chi-square test might be used.

The magnitude of the differences in outcomes to be calculated to include the percentage of women practicing certain breastfeeding behaviors (e.g., exclusive breastfeeding at one month postpartum) and the average duration of exclusive breastfeeding in each group. Due to the uncertainties introduced by the use of assumptions when actual values are not available, many analysts employ sensitivity analysis in CEA. As explained in Section II, sensitivity analysis is a technique for interpreting results in which alternative values of key variables or assumptions are used to determine the impact of a change in one variable or assumption on the final conclusions of the analysis. Given the imprecision of measuring effects, it is reasonable to believe that no single number can usually be used authoritatively. Cost-effectiveness analyses that demonstrate little variation throughout the possible range of assumed values of a variable give the decision maker greater confidence in the results of the CEA. If, however, the results are sensitive to alternative estimates (changing appreciably among the alternatives), further research may be indicated to measure variables more precisely, thus ensuring the reliability of the study's results on effects. The magnitudes of change shown by sensitivity analyses can also demonstrate which variables require greater specificity during the study.

You can use your estimates of effects -- especially if they are supported by the encouraging results of sensitivity analysis -- for advocating for your breastfeeding promotion program as well as for identifying the specific promotion activities that most merit additional investments.

V. COST-EFFECTIVENESS ANALYSES

This section describes the steps for cost-effectiveness analyses. These include:

COST-EFFECTIVENESS ANALYSES	
STEP 20	Relate cost estimates to effectiveness estimates
STEP 21	Interpret the results

Step 20. Relate cost estimates to effectiveness estimates.

As defined in Section I, cost-effectiveness analysis relates the costs of a program to its effects. All of the essential components of a CEA (costs, savings, and effects) have been presented in Sections II, III, and IV, respectively. Now, you can put them together. Step 20 calls for conducting one or more cost-effectiveness analyses of your breastfeeding promotion program -- that is, you will relate cost estimates to effectiveness estimates.

A CEA should be performed, if possible, whenever you are faced with alternative ways to proceed. The question might be whether to expand a breastfeeding promotion program or which of several types of promotion is deemed most cost-effective. If cost per positive effect is lower for one breastfeeding program than for another, the first one is more "cost-effective." That is, it is more efficient in achieving the desired effect.

Decisions made on the basis of the results of a CEA are more likely to be premised on net costs (net of savings) than on gross costs, though results could be presented before and after netting out savings. Table 12 provides a framework for presenting the results of a CEA for the specific effect of additional infants exclusively breasted in response to a promotion program. For clarity, the CEA includes both gross and net costs.

TABLE 12

Net Cost-Effectiveness of Breastfeeding Promotion Program, [year]

Costs		Effect (Additional number of infants exclusively breastfed)	Cost-Effectiveness
Gross Costs	$____		
Cost Savings	$____		
Net Costs	$____	_____	$_____ per additional infant exclusively breastfed

Notes: Net costs = Gross Costs - Cost Savings.
Alternative measures of effects might be substituted for additional infants breastfed, and their corresponding cost-effectiveness values could be similarly calculated.

Sources: Gross Costs -- Table 7;
Cost Savings -- Table 9 (Actually, an equivalent table that would cover all types of cost savings for all stages.);
Effect -- Table 10.

Suppose that you have succeeded in estimating the net costs of your institution's breastfeeding promotion program by following these *Guidelines*. It is assumed that you have estimated an intermediate effect (outcome) in the form of an improvement in breastfeeding practices as measured by the number of additional infants exclusively breastfed at one month of age. You might have used another outcome measure such as the number of additional infants being breastfed at all if that information could have been easily gathered. Additional possible effects in the form of impacts might have been estimated in terms of reduced disease burden (e.g., number of diarrheal cases or deaths averted and/or disability-adjusted life years saved). None of these alternative measures is illustrated here. Once estimated, however, they would enter into a CEA in much the same way as the exclusive breastfeeding measure.

The results of the CEA can be readily summarized as displayed in Table 12, which draws on Tables 7, 9, and 10 to obtain values for net costs and the chosen effect. Cost-effectiveness is shown in Table 12 as the result of dividing net costs by the chosen effect to yield cost per additional infant exclusively breastfed (attributable to the breastfeeding promotion). Of course, if you elect to estimate effects in terms of other measures, you must expand Table 12 or add another table to show your alternative results, which might take such forms as cost per additional infant breastfed at all or cost per diarrheal case or death averted. Figure 1 in Annex C plots DALY-related results from many health interventions in relation to their costs.

Step 21. Interpret the Results.

Interpreting the results and using them for monitoring and evaluation, advocacy, and even policy all require caution, because the apparent cost-effectiveness of a program depends on several important factors unique to that program. If your interpretations involve comparisons among different programs, the differences portrayed in cost-effectiveness terms could depend on the following four groups of factors that affect costs, savings, and impacts:

- the starting point from which further improvements in breastfeeding services are sought;
- the sociocultural and economic environment (e.g., type of women served, baseline breastfeeding levels, prices);
- relevant hospital practices (e.g., length of stay, number of births, proportion of caesareans);
- the nature of the breastfeeding intervention itself (e.g., degree of targeting, quality, balance of activities, choice of inputs, level of investment).

You might be able to adjust the numeric results to allow for some of these factors while you take other results into account only qualitatively.

A fundamental aim of cost-effectiveness estimation is to judge the efficiency of allocating resources to a program such as breastfeeding promotion for purposes of guiding the setting of priorities for resource allocation and performing regular monitoring of hospital activities. Cost-effectiveness estimation can also support the advocacy of efficient programs. To assess the prospects for future financing, including alternative funding sources and overall sustainability, costs and cost-effectiveness both constitute pertinent information.

Illustrations of the importance and usefulness of selected results of breastfeeding promotion are presented in the following statement from the final report on the LAC HNS studies conducted in Mexico, Brazil, and Honduras:

> The results suggest that considerable increases in savings are possible through expansion of rooming-in and possibly "bedding-in," limiting the use of infant formula to very few instances, reconsidering the need for milk banks, and rationalizing the use of uterine-contracting drugs. Increases in effectiveness can be expected from greater attention to the quality and coverage of maternal education and support, aimed particularly at confidence-building and teaching specific lactation management skills. Support during the postnatal period appears to be especially important for sustaining exclusive breastfeeding, yet is an especially weak component of maternal education programs. The payoffs from breastfeeding investments are substantial for hospitals in terms of reduced

costs for maternity cases and fewer pediatric infection cases. Establishing national policies and government directives on specific breastfeeding norms and routines and incorporating good breastfeeding training in to the basic medical curricula can save individual hospitals considerable resources in lobbying and in-hospital training (Sanghvi, 1995).

It is clear, then, that undertaking cost and cost-effectiveness analyses of your program can yield many beneficial returns.

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ANNEXES

Annex A

Annualization factors

Expected useful life in years	Discount rate 1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0 990	0 980	0 971	0 962	0 952	0 943	0 935	0 926	0 917	0 909	0 901	0 893	0 885	0 877	0 870	0 862	0 855	0 847	0 840	0 833
2	1 970	1 942	1 913	1 886	1 859	1 833	1 808	1 783	1 759	1 736	1 713	1 690	1 668	1 647	1 626	1 605	1 585	1 566	1 547	1 528
3	2 941	2 884	2 829	2 775	2 723	2 673	2 624	2 577	2 531	2 487	2 444	2 402	2 361	2 322	2 283	2 246	2 210	2 174	2 140	2 106
4	3 902	3 808	3 717	3 630	3 546	3 465	3 387	3 312	3 240	3 170	3 102	3 037	2 974	2 914	2 855	2 798	2 743	2 690	2 639	2 589
5	4 853	4 713	4 580	4 452	4 329	4 212	4 100	3 993	3 890	3 791	3 696	3 605	3 517	3 433	3 352	3 274	3 199	3 127	3 058	2 991
6	5 795	5 601	5 417	5 242	5 076	4 917	4 767	4 623	4 486	4 355	4 231	4 111	3 998	3 889	3 784	3 685	3 589	3 498	3 410	3 326
7	6 728	6 472	6 230	6 002	5 786	5 582	5 389	5 206	5 033	4 868	4 712	4 564	4 423	4 288	4 160	4 039	3 922	3 812	3 706	3 605
8	7 652	7 325	7 020	6 733	6 463	6 210	5 971	5 747	5 535	5 335	5 146	4 968	4 799	4 639	4 487	4 344	4 207	4 078	3 954	3 837
9	8 566	8 162	7 878	7 435	7 108	6 802	6 515	6 247	5 995	5 759	5 537	5 328	5 132	4 946	4 772	4 607	4 451	4 303	4 163	4 031
10	9 471	8 983	8 530	8 111	7 722	7 360	7 024	6 710	6 418	6 145	5 889	5 650	5 426	5 216	5 019	4 833	4 659	4 494	4 339	4 192
11	10 368	9 787	9 253	8 760	8 306	7 887	7 499	7 139	6 805	6 495	6 207	5 938	5 687	5 453	5 234	5 029	4 836	4 656	4 486	4 327
12	11 255	10 575	9 954	9 385	8 863	8 384	7 943	7 536	7 161	6 814	6 492	6 194	5 918	5 660	5 421	5 197	4 988	4 793	4 611	4 439
13	12 134	11 348	10 635	9 986	9 394	8 853	8 358	7 904	7 487	7 103	6 750	6 424	6 122	5 842	5 583	5 342	5 118	4 910	4 715	4 533
14	13 004	12 106	11 296	10 563	9 899	9 295	8 745	8 244	7 786	7 367	6 982	6 628	6 302	6 002	5 724	5 468	5 229	5 008	4 802	4 611
15	13 865	12 849	11 938	11 118	10 380	9 712	9 108	8 559	8 061	7 606	7 191	6 811	6 462	6 142	5 847	5 575	5 324	5 092	4 876	4 675
16	14 718	13 578	12 561	11 652	10 838	10 106	9 447	8 851	8 313	7 824	7 379	6 974	6 604	6 265	5 954	5 668	5 405	5 162	4 938	4 730
17	15 562	14 292	13 166	12 166	11 274	10 477	9 763	9 122	8 544	8 022	7 549	7 120	6 729	6 373	6 047	5 749	5 475	5 222	4 990	4 775
18	16 398	14 992	13 754	12 659	11 690	10 828	10 059	9 372	8 756	8 201	7 702	7 250	6 840	6 467	6 128	5 818	5 534	5 273	5 033	4 812
19	17 226	15 678	14 324	13 134	12 085	11 158	10 336	9 604	8 950	8 365	7 839	7 366	6 938	6 550	6 198	5 877	5 584	5 316	5 070	4 843
20	18 046	16 351	14 877	13 590	12 462	11 470	10 594	9 818	9 129	8 514	7 963	7 469	7 025	6 623	6 259	5 929	5 628	5 353	5 101	4 870
21	18 857	17 011	15 415	14 029	12 821	11 764	10 836	10 017	9 292	8 649	8 075	7 562	7 102	6 687	6 312	5 973	5 665	5 384	5 127	4 891
22	19 660	17 658	15 937	14 451	13 163	12 042	11 061	10 201	9 442	8 772	8 176	7 645	7 170	6 743	6 359	6 011	5 696	5 410	5 149	4 909
23	20 456	18 292	16 444	14 857	13 489	12 303	11 272	10 371	9 580	8 883	8 266	7 718	7 230	6 792	6 399	6 044	5 723	5 432	5 167	4 925
24	21 243	18 914	16 936	15 247	13 799	12 550	11 469	10 529	9 707	8 985	8 348	7 784	7 283	6 835	6 434	6 073	5 746	5 451	5 182	4 937
25	22 023	19 523	17 413	15 622	14 094	12 783	11 654	10 675	9 823	9 077	8 422	7 843	7 330	6 873	6 464	6 097	5 766	5 467	5 195	4 948
26	22 795	20 121	17 877	15 983	14 375	13 003	11 826	10 810	9 929	9 161	8 488	7 896	7 372	6 906	6 491	6 118	5 783	5 480	5 206	4 956
27	23 560	20 707	18 327	16 330	14 643	13 211	11 987	10 935	10 027	9 237	8 548	7 943	7 409	6 935	6 514	6 136	5 798	5 492	5 215	4 964
28	24 316	21 281	18 764	16 663	14 898	13 406	12 137	11 051	10 116	9 307	8 602	7 984	7 441	6 961	6 534	6 152	5 810	5 502	5 223	4 970
29	25 066	21 844	19 188	16 984	15 141	13 591	12 278	11 158	10 198	9 370	8 650	8 022	7 470	6 983	6 551	6 166	5 820	5 510	5 229	4 975
30	25 808	22 396	19 600	17 292	15 372	13 765	12 409	11 258	10 274	9 427	8 694	8 055	7 496	7 003	6 566	6 177	5 829	5 517	5 235	4 979

Annex B

Worksheet B.1

Savings from Reduced Use of Breastmilk Substitute, [year]: Alternative Approaches to Estimation

Approach A: Historical Record

Year	No. of Live Births per Year	Amount of Formula Purchased (Q)	Price per Unit (P) [1995]	Cost (QxP)
Pre-program:				
1991	_____	_____		
1992	_____	_____		
1993	_____	_____		
Average	_____	_____	_____	_____
Program:				
1994	_____	_____		
1995	_____	_____		
Average	_____	_____	_____	_____
Saving (Pre-program - Program)				_____

Worksheet B.1 (continued)

Approach B: Expert Judgment

Question	Response
Average number of formula feeds during hospital stay per baby (W) = Product of:	_____
Average number of formula feeds per day	_____
& Average number of days per stay	_____
Amount of powdered milk in each feed:	
• Quantity of made-up formula per feed (Y)	_____
• Grams of powdered milk per 1,000 ml. (Z)	_____
Number of babies who do not receive formula under program but would have under old policy:	
• The percent of babies who used to be fed formula (F1)	_____
• The percent of babies who are now fed formula (F2)	_____
Current number of live births (A)	_____
After responses of experts, calculate the quantity saved (Q) as: A x W x Y x (Z/1,000) x [(F1- F2)/100] =	_____
Calculate the cost saved as Q x Price [per gram] =	_____

Notes: In an actual study, similar cost savings estimates would be shown for every stage.
Equivalent data collection could occur also for other categories of inputs, such as personnel.

Sources: To be entered for either approach used.

Worksheet B.2

Savings from Reduced Use of Glucose Water, [year]: Alternative Approaches to Estimation

Approach A: Historical Record

Year	No. of Live Births per Year	Amount of Glucose Water (Q)	Price per Unit (P) [1995]	Cost (QxP)
Pre-program:				
1991				
1992				
1993				
Average				
Program:				
1994				
1995				
Average				
Saving (Pre-program -Program)				

Worksheet B.2 (continued)

Approach B: Expert Judgment

Question	Response
Average number of glucose feeds during hospital stay per baby (W) = Product of:	_____
Average number of glucose feeds per day	_____
& Average number of days per stay	_____
Quantity consumed at each glucose feed (Y)	_____
Number of babies who do not receive glucose under program but would have under old policy:	
• The percentage of babies who uses to be fed glucose (F1)	_____
• The percentage of babies who are now fed glucose (F2)	_____
Current number of live births (A)	_____
After responses of experts, calculate the quantity saved (Q) as: A x W x Y x [(F1 - F2)/100] =	_____
Calculate the cost saved as: Q x Price =	_____

Note: In an actual study, similar cost savings estimates would be shown for every stage. Equivalent data collection could occur also for other categories of inputs such as personnel.

Sources: To be entered for either approach used.

Worksheet B.3

Savings from Reduced Use of Bottles and Nipples, [year]: Alternative Approaches to Estimation

Approach A: Historical Record

Year	No. of Live Births Per Year	No. of Baby Bottles Purchased (Q)	Bottle Price (P) [1995]	Bottle Cost (QxP)	No. of Nipples Purchased (Q)	Nipple Price (P) [1995]	Nipple Cost (QxP)
Pre-program:							
1991	_____	_____					
1992	_____	_____					
1993	_____	_____					
Average	_____	_____	_____	_____	_____	_____	_____
Program:							
1994	_____	_____					
1995	_____	_____					
Average	_____	_____	_____	_____	_____	_____	_____
Saving (Pre-program - Program)				_____			_____

Total Savings from Both Bottles & Nipples _____

Worksheet B.3 (continued)

Approach B: Expert Judgment

Questions	Response
How many bottles currently "in use" (taking into account that some bottles are being prepared, others given to babies, and others being washed) (BB)?	_____
How many months before the average bottle replaced (BT)?	_____
How many nipples currently "in use" (taking into account that some are being prepared, others given to babies and others being washed) (NB)?	_____
How many months before the average nipple is replaced (NT)?	_____
How many babies currently bottle fed under program (BFB)?	_____
The percentage of babies who used to be fed formula under old program (F1)?	_____
The percentage of babies who are now fed formula (F2)?	_____
Current number of live births (A)?	_____

After responses of experts, calculate the quantity saved (Q) as follows:

Bottles:

A x [(F1-F2)/100] x [BB x 12/BT)/BFB] = _____

Nipples:

A x [(F1-F2)/100] x [NB x 12/NT)/BFB] = _____

Calculate the costs saved (Q x P) where P= price:

Bottles _____

Nipples _____

Total Cost Saved _____

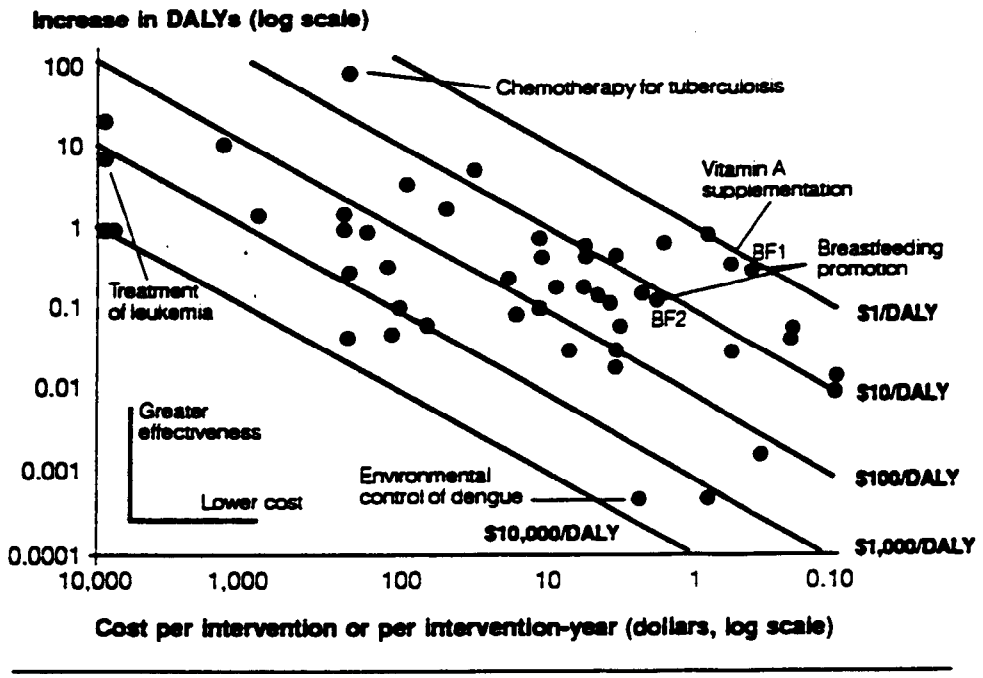
Notes: In an actual study, similar cost savings estimates would be shown for every stage. Equivalent data collection could occur also for other categories of inputs such as personnel.

Source: To be entered for either approach used.

Annex C

Figure 1:

Benefits and Costs of Health and Nutrition Interventions



BF1 = programs moving from formula feeding to no formula + education (Brazil historical, Mexico)

BF2 = programs investing in education and promotion after formula removal (Honduras, Brazil current)

(Adapted from the World Development Report 1993.)